

INDIAN DRAGONFLIES.

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Part XXXVII.

(With 1 plate and 2 text-figures.)

(Continued from page 738 of Volume XXXIV.)

Sub-family: PLATYSTICTINAE.

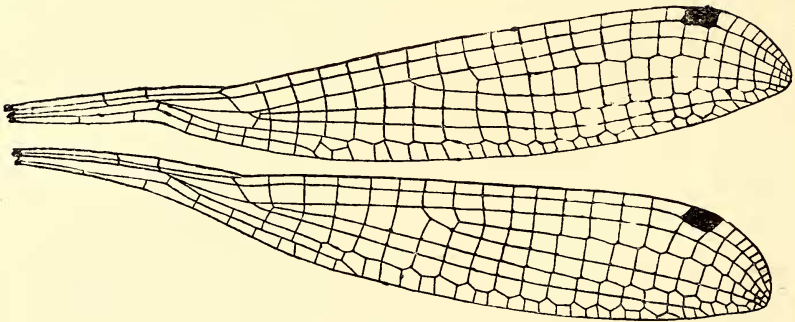


Fig. 1.

Wings of *Protosticta himalaica* Laid.

Genus *Platysticta* Selys. Bull. Acad. Belg. (2) x. p. 436 (1860); Id. *ibid.*, pp. 144, 145 (1886).

Legion *Platysticta* Laid. Rec. Ind. Mus. vol. xiii, p. 323 (1917).

Sub-family *Platystictinae* Laid. *Spolia Zeylanica*, vol. xii, pp. 300, 301 (1924).

Dragonflies of small size, coloured black or brown with white markings, or more rarely reddish marked with blue, rarely if ever metallic; resting with wings folded over dorsum; wings very narrow, falcate at apex, hyaline or tipped with black at apices; the nervure *ac* situated midway between the two antenodal nervures; an accessory basal postcostal nervure always present and situated well proximad of *ac*; petiolation beginning well distad of the nervure *ac*; the nervure *ab* reduced or absent and when present, extending from *ac* or the posterior border of wing to the posterior side of the discoidal cell; *IA* absent; *Ciii* markedly reduced, falling well short of middle of wings; discoidal cell elongate, about four times as long as broad, the ends squared; sectors of are arising from the lower end of arc, separate or confluent for a short distance at origin; individual cells mostly four-sided, more rarely five-sided; *Riii* arising well distad of node, nearer node than pterostigma; origin of *R4 + 5* variable, either slightly proximad, at, or slightly distal of the oblique nervure descending from the subnode; pterostigma short and broad, its costal side usually shorter than the posterior, its inner or proximal side oblique, its distal straight or slightly rounded; no intercalated sectors present except *IKii*.

Abdomen of great length and very slender, in some genera twice or more than twice the length of hindwing, the relative lengths of segments 8, 9 and 10 variable in individual species; anal appendages of male complex, variable in

the species, the superiors usually forcipate and often chelate at the apices or spatulate; inferior appendages more simplified, usually tapering to a point but spatulate in others. Vulvar scales very robust, extending beyond end of abdomen in most species and with a robust dorsal spine-like protuberance before the apex. Penile organ variable, with or without a frill or ridge on the dorsum, the end curling strongly over the stem which its terminal branches embrace.

Larvæ slender, cylindrical, furnished with three triquetral gills, mask flat, subquadrate, Gomphine-like, without setae, middle lobe cleft, lateral lobe robust, furnished with a long moveable hook, legs long and slim, breeding in torrential montane streams or seepages on the sides of hills in dense virgin jungle.

Distribution.—Tropical and neotropical. Within our limits, from Ceylon, Western Ghats, Northwestern India and Burma, in submontane and montane tracts, rarely at sea-level. Species are found haunting the banks of mountain streams of small size, often a mere trickle over rocks or a chain of pools below a spring on a steep jungly hillside in dense shade. Many species inhabit small caves among boulders and rocks beside streams where they exist in a perpetual twilight. In flight they are much given to hovering with the long attenuated abdomen held stiffly and horizontally out, whilst the insect advances or retires in a series of short jerky movements and, if approached head on, will retire backwards instead of reversing and heading off, this backward flying seeming to be accomplished as easily as the forward movement. Owing to their dull colouring, small size and dark surroundings, they are remarkably inconspicuous during flight and would be invisible were it not for the chain of white and blue spots on the abdomen seen to be moving stealthily about the dark recesses. The vivid blue identification marks on the terminal segments of the abdomen show up with remarkable conspicuousness even in the darkest retreats when the insect is at rest.

Ceylon is remarkably rich in *Platystictas*, whilst Continental India and Burma is equally rich in *Protostictas* and *Drepanostictas*.

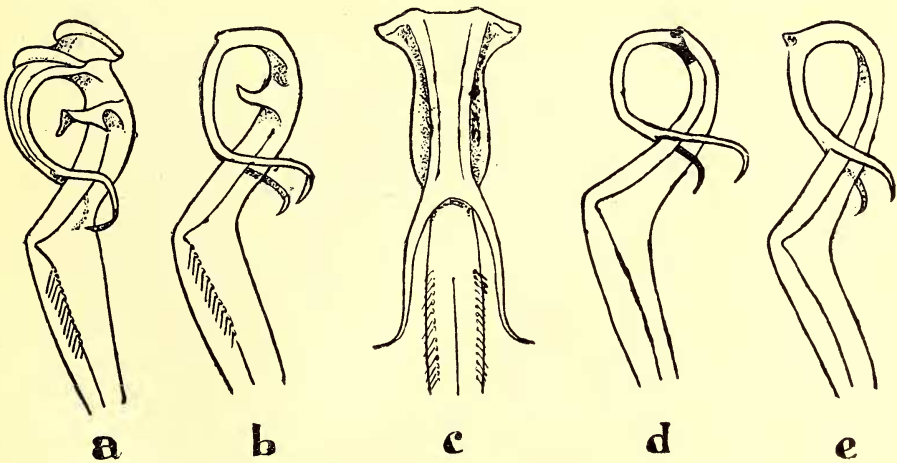


Fig. 2. Penile organs of,—

- a. *Platysticta deccanensis* (Laid).
- b. *Ceylonosticta hilaris* (Selys).
- c. *Platysticta maculata* (Selys).
- d. *Drepanosticta carmichaeli* (Laid).
- e. *Protosticta graveleyi* (Laid).

Figure a shows the dorsal frill in the dorso-lateral position; figure b the same in profile, figure c the penile organ viewed dorsally, whilst the two remaining figures show the organs viewed from the side; note the absence of the dorsal frill in these.

The former group are sharply separated from the Indian forms by the penile organ which possesses a ridge on its dorsum, absent in the two latter groups, and I have employed this character as a means of classifying an otherwise difficult group of insects. Selys classed the whole of the Ceylon species as *Platysticta* and divided these into two subgenera from venational characters. To the first subgenus a south Indian species has to be added, whilst the second subgenus has been incorporated by Dr. Laidlaw in his genus *Drepanosticta*. The penile organ of this subgenus, so far as the Ceylon forms goes, differs from that of the Indian forms, which furnish the genotype and it is therefore clear that the two groups are not congeneric, although venationally they agree. This being the case I have here retained Laidlaw's genus *Drepanosticta* for the Indian species and have created a new genus *Ceylonosticta* for the Ceylon forms which possess *Drepanosticta* venation. The chain of evolution is probably *Protosticta*, *Drepanosticta*, *Ceylonosticta* and finally *Platysticta*, or the two latter genera may have evolved independently from *Protosticta* and on parallel lines to *Drepanosticta*.

The enormous length of the abdomen of these insects and the complex nature of the anal appendages, admirably adapted as they are for obtaining an enormous grip of the female prothorax, are probably coordinated with the function of oviposition, and I surmise that they enable the male to lower its mate into the swiftly flowing current of the streams they frequent, without fear of it being swept away. (See Fig. 2 Plate.)

Key to the Indian genera of *Platystictinae*.

- | | | | |
|---|---|---|------------------------|
| 1 | { | Ceylon forms ; penis with ridge on dorsum simulating a dorsal spine as seen in profile | 2. |
| | | Indian and Burmese forms ; penis without ridge on dorsum | 3. |
| 2 | { | Sectors of arc separate and divergent from origin ; the nervure <i>IRiii</i> zigzagged almost from origin ... | <i>Platysticta</i> . |
| | | Sectors confluent at and for some distance from origin ; the nervure <i>IRiii</i> not zigzagged | <i>Ceylonosticta</i> . |
| 3 | { | The nervure <i>ab</i> entirely absent | <i>Protosticta</i> . |
| | | The nervure <i>ab</i> present | <i>Drepanosticta</i> . |

Genus PROTOSTICTA Selys (1885)

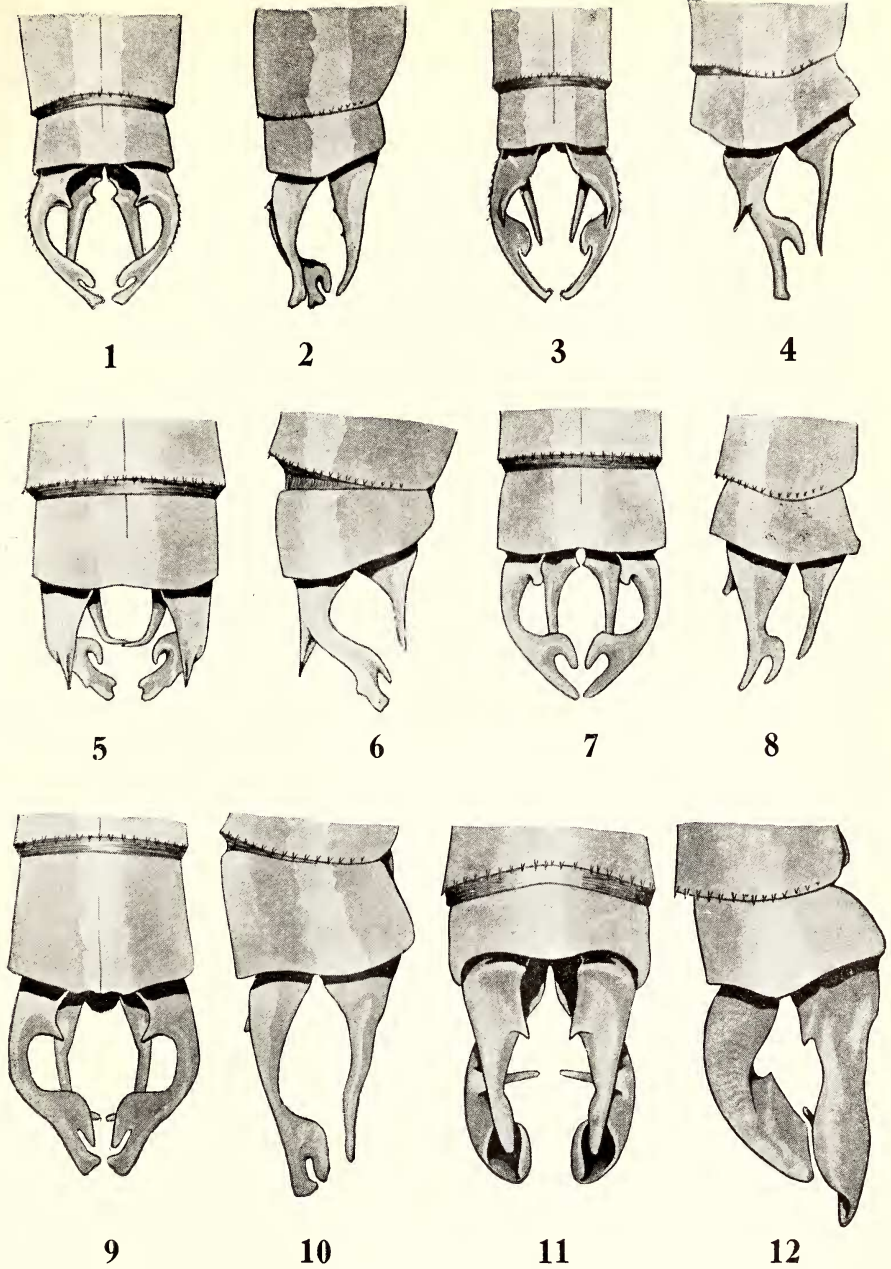
Protosticta Selys, C. R. Soc. Ent. Belg. xxix. p. cxlv, (1835); Id. Mem. Cour. xxxviii, p. 157 (1886); Laid. Rec. Ind. Mus. vol. xi, p. 391 (1915); Id. ibid. vol. xiii, pp. 339, 342 (1917); Fras. ibid. vol. xxiv, pp. 4 and 5 (1922); Id. ibid. vol. xxvi, p. 499 (1924).

Zygopterous dragonflies of small size and slender build with characters of the subfamily, coloured steely black marked with white and turquoise blue; wings hyaline, immaculate, long, narrow, falcate, cells mostly four-sided; sectors of arc fused for a short distance from origin, thus arising from a common stalk; *IRiii* straight, never zigzagged; *R* 4 + 5 arising at or a little proximad or distad of the oblique nervure descending from the subnode; *ab* entirely absent. Abdomen of great length, especially in the male, double or more than double the length of hindwing (excepting *P. hearseyi*), segments 3 to 7 very slim and very long, segments 8 to 10 varying in length in the species and sexes, 9 sometimes as long as 8, 10 very short. Anal appendages about twice the length of segment 10, angulated downward and inwards at their middle and chelate at apices (except in *P. himalaica* and *P. uncatius* which are spatulate), inferiors simple, broad at base, tapering thereafter to a fine point, incurved or not. Vulvar scale as for sub-family. Larvæ as for sub-family but only those of *P. gravelyi* and *P. mortonii* known).

Genotype.—*Protosticta simplicinervis* Selys.

Distribution.—The Western Ghats of India from sea-level to 4,000 ft. and North-East India and Burma from 3,000 to 6,000 ft. Habits those of the sub-family; see also under species.

Species of this genus are remarkably local in distribution and in some cases have been found confined to one spot for years, streams close by, never rendering a single specimen; this may be explained by their weak flight, although, some at least, *P. mortonii* and *P. gravelyi*, do wander afar from their habitats.



Explanation of Plate.

1. Anal appendages of *Protosticta hearseyi* Fraser, dorsal view.
2. The same seen from the right side.
3. The same of *Protosticta mortoni* Fraser, dorsal view.
4. The same seen from the right side.
5. The same of *Protosticta sanguinostigma* Fraser, dorsal view.
6. The same seen from the right side.
7. The same of *Protosticta graveleyi* Laidlaw, dorsal view.
8. The same seen from the right side.
9. The same of *Protosticta davenporti* sp. nov., dorsal view.
10. The same seen from the right side.
11. The same of *Protosticta himalaica* Laidlaw, dorsal view.
12. The same seen from the right side.

Camera lucida studies all drawn to the same scale.

Col. F. Wall has taken one species at light and I have on several occasions found specimens hovering about the windscreen of my car or actually coming inside. On one occasion I took a male in my bungalow, but this may have come to light the night before. As a rule though, species form definite and lasting colonies, restricted to small districts or even streams.

Key to species of genus *Protosticta*.

- | | | | |
|---|---|--|----------------------------|
| 1 | { | Small species with ground colouring cupreous and abdomen of both sexes considerably less than 40 mm. in length; male and female of the same length ... | <i>P. hearseyi</i> . |
| | | Larger species with ground colouring steely black and abdomen more than 40 mm. in length; male always considerably longer than the female ... | 2. |
| 2 | { | Pterostigma in both sexes blood red ... | <i>P. sanguinostigma</i> . |
| | | Pterostigma in both sexes black ... | 3. |
| 3 | { | Superior anal appendages chelate at apex ... | 4. |
| | | Superior anal appendages spatulate at apex ... | 6. |
| 4 | { | Basal half of segment 8 pale blue with the middorsal carina finely black; superior anal appendages with the claw-like arms narrow and of subequal length ... | <i>P. gravelyi</i> . |
| | | Basal half of segment 8 pale blue, the middorsal carina not marked with black; superior anal appendages varying as shown below ... | 5. |
| 5 | { | Outer fork of superior anal appendages thickened, obtuse at apex and but slightly longer than the inner ... | <i>P. davanportii</i> . |
| | | Outer fork of superior anal appendages very narrow, and nearly four times the length of inner ... | <i>P. mertonie</i> . |
| 6 | { | Inferior anal appendages with a long finger-like medial spine directed inwards ... | <i>P. himalaica</i> . |
| | | Inferior anal appendages without an inner spine ... | <i>P. uncatius</i> . |

***Protosticta gravelyi* Laidlaw.**

Protosticta gravelyi Laid. Rec. Ind. Mus. xi, vol. pp. 389, 390, text-fig. 2. (1915); Id. *ibid.* vol. xiii, p. 342 (1917); Fras. *ibid.* vol. xvi, p. 499 (1924).

Protosticta stevensi Fras. Rec. Ind. Mus. vol. xxiv, pp. 7 and 8. Pl. 1, figs. 1, 2 and 7 (1923); Id. *ibid.* vol. xxvi, p. 499 (1924).

Male. Abdomen 46-49 mm. Hindwing 20-22 mm.

Head,—labium brownish black; labrum turquoise blue, rather broadly bordered with black along its free margin; clypeus pale turquoise blue; frons, vertex and occiput glossy black; eyes dark bottle green paling to pale greenish beneath.

Prothorax creamy white marked dorsally with a broad black triangle with its base occupying the greater part of posterior lobe and its apex tapering to the middle of the mid lobe.

Thorax steely glossy black marked with a broad oblique creamy white stripe on each side extending to the middle pair of legs, and a similar stripe on the posterior part of metepimeron extending on to the hinder pair of legs. Beneath marked with broad black stripes on each side which converge and fuse anteriorly.

Legs creamy white, the knees darker. Hind pair of femora occasionally marked on the extensor surface with a brown stripe.

Wings hyaline; 13-14 postnodal nervures to forewings, 12-13 in the hind; pterostigma black, nearly half as long again as broad, the costal side shorter than the posterior, outer border nearly straight, inner oblique; *R* 4 + 5 arising slightly or well distad of the level of subnode.

Abdomen black marked with white and turquoise blue as follows,—segments 1 and 2 white laterally, segment 3 with a narrow basal annule finely divided with black on the dorsum, segments 4 to 7 with broad basal annules gradually broadening as far as 7 and partially divided on the middorsal carina by the

ground colour, segment 8 with nearly its basal half turquoise blue, this extending apicad on the sides and ventrally but divided along the middorsal carina by a fine black line, segments 9 and 10 unmarked. Segment 9 double the length of 10, and 8 double the length of 9.

Anal appendages black (figures 7 and 8 Pl.) Superiors forcipate, chelate, half as long again as segment 10, broad at base where they are furnished with an inner and dorsal blunt rounded tooth, then tapering, but again expanded at the apical half into a 'finger-and-thumb' like structure, the finger process being a little longer than the thumb. Inferior appendages about three-fourths the length of superiors, broad and conical at base, then tapering rather rapidly to apex, furnished with an inner stout spine at base.

Female. Abdomen 33-35 mm. Hindwing 19-23 mm.

Very similar to the male but shorter and more robustly built, differs as follows,—black bordering of labrum broader; eyes, in the living state with a diffuse white spot on the outer sides; wings with 13-14 postnodal nervures to all wings. Abdomen shorter and stouter, especially from segment 7 to the anal end, the former segment nearly three times as long as 8, which is itself actually shorter than segment 9, the latter segment being three times the length of segment 10. The basal annule on segment 7 occupying only about one-fifth the length of segment and often interrupted on the dorsum, whilst 8 is unmarked save for a large white spot situated at the base on each side; segments 9 and 10 immaculate but the former sometimes with a large lateral white spot. Anal appendages black, barely as long as segment 10, broad, conical, pointed at apex.

Distribution.—This species is the most widely distributed of all the Protostictas and occurs in many ravines from 2,000 to 4,000 ft. in many parts of the Western Ghats. It occurs in the Nilgiri Hills on both sides of the plateau, at Kallar, Burliyar and Gudalur, from May to June. In Malabar and Cochin it occurs in the Vayitri, Nilambur and Kavalai Ghats from May to June and again in September and October. It may be found lurking amongst rocks and ferns or in the dark tunnels formed by trees and shrubs overhanging torrential beds. In flight it holds its abdomen rigidly horizontal and advances in short jerks on its objective or reverses and flies backwards with equal ease, and is visible in the prevailing gloom only by the chain of white dots marking the bases of the segments. Type in Indian Museum, paratypes in British Museum, etc.

Some confusion has arisen over this species probably due to the fact that the type is immature and in very poor condition, with its abdomen crumpled up and appendages distorted. The marking on segment 8 has been given as that for 7, and the length of the abdomen has been given as that for the body. It was due to these excusable errors that *P. stevensi* was described by myself as a separate species. Since then I have had an opportunity of examining the type and female cotype and making new measurements. From this I find that *gravelyi* and *stevensi* are conspecific, Dr. Laidlaw's name having priority. The female I find is really that of *P. mortoni*; it is to be remembered that when Dr. Laidlaw described these sexes, *P. gravelyi* represented the only Indian Protosticta then known, so that it was but natural he should consider the insects as the two sexes of one species, although taken in different localities.

Protosticta davenporti sp. nov.

Male. Abdomen 43-45 mm. Hindwing 23-24 mm.

Very similar to *P. gravelyi* from which it differs however by its much more robust build, this character being very striking when the insects are confronted. It is then seen that although the abdomen of *P. gravelyi* is longer, the head and thorax are of much slighter build and the wings are correspondingly shorter and narrower. The anal appendages although built on the same plan as those of *P. gravelyi*, have very marked differences.

Head, prothorax and thorax similar to *P. gravelyi* but the markings more definitely bluish and the black dorsal marking of the prothorax restricted to the middle portion of the posterior lobe and ending as two points on the dorsum of the mid lobe.

Wings broader and longer; pterostigma black, half as long again as broad, 14-15 postnodal nervures to forewings, 13-14 in the hind, (One specimen is remarkable in possessing four postcostal nervures in one of its wings, instead

of the usual nervure *ac* and one additional postcostal); R_4+5 arising opposite the level of subnode.

Abdomen black with the sides of segments 1 and 2 and the base of 3 bluish white; segments 4 to 7 with narrow white basal annules which broaden apicad on the sides; segment 8 with its basal third or half pale turquoise blue, this colour extending nearly to apex of segment laterally, but not divided on the middorsum as in *P. graveleyi*. The blue annule on this segment separated from the extreme base by a narrow triangle of black. Segments 9 and 10 immaculate and of the same relative lengths as in *P. graveleyi*.

Legs differing from the latter species by the femora black, the two hinder pairs white on the extensor surfaces and the middle pair with a large white distal spot at the distal ends on the outer side; tibiæ dirty white, tarsus black.

Anal appendages black. (Pl. figs. 9 and 10.) Superiors forcipate, chelate, half as long again as segment 10, broad at base where they present a large inner sub-basal pointed tooth or spine, then narrowing abruptly and expanding again in the distal half to form a 'finger-and-thumb' like structure which differs from that of *P. graveleyi* by the finger process shorter and broader and with its apex broadened and flexed inwards to almost meet the apex of the thumb; outer border of this appendage very sinuous, not gradually curved as in the last species. Inferior appendages broad at base, then tapered gradually to apex, slightly sinuous as seen in profile but with a distinct angulation about the middle as seen from above and with the apical fourth curled rather abruptly inwards; nearly as long as superior appendages.

Distribution.—Confined so far as known to the Annaimallai and Mudis Hills at elevations of about 3,000 to 4,000 ft. and found in similar situations to the last species. The shape of the anal appendages shown in Pl. figs. 9 and 10, will serve to distinguish this fine insect from all other Protostictas. Type in British Museum paratypes in author's collection.

Protosticta sanguinostigma, Fraser.

Protosticta sanguinostigma, Fras. Rec. Ind. Mus. vol. xxiv, pp. 6 and 7, Pl. 1, figs. 5 and 6 (1922); *Id* *ibid.* vol. xxvi, p. 499 (1924).

Protosticta cerinostigma, Fras. (*var.*) *ibid.* vol. xxvi, pp. 499, 509 (1924).

Male. Abdomen 42-45 mm. Hindwing 22-26 mm.

Head,—labium yellowish; labrum turquoise blue narrowly bordered with black along the free margin; clypeus turquoise blue; frons, vertex and occiput glossy black, the latter marked with a transverse coppery brown fascia; eyes bottle green, pale greenish blue below, these two colours separated by an equatorial band of blackish brown which crosses the head from above and behind somewhat obliquely.

Prothorax black on dorsum, whitish laterally, the mid lobe marked with a large oval blue spot on each side the middle line.

Thorax glossy steely or bronzed black, pale blue on the sides where a narrow oblique stripe of black bordered with brown traverses the anterior border of the metepimeron. Beneath immaculate, thus contrasting strongly with the two former species.

Legs pale yellow, femora lined with black on extensor surface and with a broad brown annule at the distal ends; tibiæ clouded or stippled with brown; tarsi dark brown.

Wings hyaline; pterostigma blood red, covers one cell, of similar shape to the former species; 15-18 postnodal nervures to forewings, 14-15 in the hind; R_4+5 arising slightly or well distad of the oblique nervure descending from the subnode.

Abdomen blackish brown on dorsum, paler on the sides, marked with white and pale turquoise blue; segments 1 and 2 white laterally, segments 3 to 6 with broad distal black annules, segment 3 with a very narrow obscure white annule at the base, segments 4 to 7 with broader annules gradually increasing in depth from 4 to 7, segment 8 turquoise blue, its apical border black, this colour continued basad as a gradually narrowing tongue of black along the middorsal carina as far as the base of segment, segments 9 and 10 entirely black. Segment 7 very long and broadening apicad, segment 8 only slightly longer than 9, which is nearly three times the length of 10.

Anal appendages black (Pl. figs. 5 and 6); superiors forcipate, chelate, seen from above appearing only slightly longer than segment 10, but in profile

owing to the ends being bent strongly downward, seen to be nearly twice the length of the segment, very broad at base, then tapering and inclined strongly down and inward to end in the usual 'finger-and-thumb' process, the finger portion much broader and longer than the thumb and notched at its apex which is broad and blunt; the thumb portion curled in to nearly meet the opposing process; dorsally the basal portion continued horizontally back to end in a robust pointed spine. Inferior appendages about three-fourths the length of superiors, broad at base, then rapidly tapering to a fine point, the apical fourth angulated strongly inwards to meet or overlap its fellow on the opposite side.

Female. Abdomen 39 mm. Hindwing 26 mm.

Very similar to the male but of much shorter and stouter build, differs as follows,—the equatorial belt of black encircling the eye much better defined; prothorax a dirty white laterally and without the middorsal blue spots. Wings similar to the male, pterostigma blood red; 16-17 postnodal nervures to forewings, 14-15 in the hind, $R4+5$ arising at the same level or nearer to the subnode.

Abdomen black marked with white and turquoise blue as follows,—segment 1 with a blue spot on each side, 2 with a lateral blue spot at the base prolonged laterally apicad and ventrad, segment 3 with its middle two-thirds laterally and beneath brownish white, 4 similar and with a narrow whitish basal annule, 5 and 6 with well-marked white basal annules, the ventro-lateral markings more obscure, segment 7 with its basal third turquoise blue, the black not continued basad along the middorsal carina as in the male, remaining segments entirely black.

Anal appendages black, barely as long as segment 10, small, conical, triangular processes. Vulvar scale robust, extending beyond end of abdomen.

Distribution.—Nilgiri Hills, Coorg and Malabar Wynaad. Specimens from the two latter districts are much smaller than those from the Nilgiris. In the latter district it is moderately common in the Burliyar ravine, Mettupalayam Ghat at 1,500 ft., but very rare on the opposite side of the plateau, where the variety *cerinogstigma* was found. (Structurally this latter insect does not differ from type so that I consider it to be merely a variety.) In Coorg it is located to Hallery, whilst in the Wynaad, it appears to be restricted to the Vayitri and Nilambur Ghats from May to October. The blood red pterostigma and the shape of the anal appendages, relative lengths of the terminal abdominal segments, etc. will serve to differentiate this beautiful species from all other *Protostictas*. Type in the British Museum.

Protosticta mortoni Fraser.

Protosticta mortoni Fras. Rec. Ind. Mus. vol. xxvi, pp. 500, 501 (1924).

Protosticta graveleyi Laid. (*mortoni* nec *graveleyi*) *ibid*, vol. xiii, p. 342 (Female) (1917).

Male. Abdomen 41-43 mm. Hindwing 20 mm.

Head,—labium blackish brown; labrum turquoise blue moderately broadly bordered with black along its free margin; clypeus turquoise blue; vertex and occiput glossy steely or bronzed black; frons black; eyes ultramine blue capped with black above, paler blue beneath.

Prothorax pale blue except the posterior lobe which is black.

Thorax steely black on dorsum, pale blue laterally, traversed along the postero-lateral suture by a broad black stripe; beneath thorax yellowish marked by two thick black stripes which converge and become confluent anteriorly as in *P. graveleyi*.

Legs white, the knees and femora sparsely stippled with black.

Wings hyaline; pterostigma black framed narrowly in pale brown and this again framed within thick black nervures; 13 postnodal nervures to forewings, 12 in the hind; $R4+5$ arising distad the oblique nervure descending from the subnode.

Abdomen black marked with turquoise blue and white as follows,—segment 1 blue laterally, segment 2 with the basal two-thirds of the sides white, 3 with a narrow white basal annule prolonged for a short distance along the sides and narrowly interrupted on the dorsum, segments 4-7 with broad white basal annules occupying about one-sixth the length of segments and prolonged along the sides and ventrum, segment 8 with the basal half turquoise blue but this colour prolonged along the sides nearly as far as the apical end of segment

and separated from the base by a narrow black annule; segments 9 and 10 entirely black. Segment 7 very long, 8 about one-third the length of 7 (In the original description, this segment was given in error as slightly more than one-fourth the length of segment 7, whereas 9 was intended), segment 9 rather more than half the length of 8 and slightly more than twice the length of 10.

Anal appendages black (Pl. figs. 3 and 4); superiors forcipate, chelate, about twice the length of segment 10, broad at base, then constricted and curved downwards and again dilated in the first part of the apical half to form the usual 'finger-and-thumb' process, the finger thrice the length of the thumb and with its extreme end angulated inward, the thumb portion short and stout; dorsally the basal portion ending in a robust pointed tooth or spine very much as seen in *P. sauguinostigma*. Inferior appendages very broad at base, then abruptly narrowed, curled gently in and tapered to a fine point, about three-fourths the length of superiors.

Female. Abdomen 32-33 mm. Hindwing 19-20 mm.

Very similar to the male but much shorter and more robust. Markings differ only on the abdomen where segment 7 has a blue basal annule occupying from one-third to one-fourth the length of segment, and segment 8 has a large basolateral whitish spot on each side, 9 and 10 entirely black. Segment 7 is rather more than four times the length of segment 8, which is itself slightly shorter than segment 9, the latter being nearly four times the length of 10.

Anal appendages very short, barely the length of segment 10, conical pointed, black. Vulvar scale very robust, extending beyond end of abdomen.

Distribution.—Very local, usually found in isolated colonies. The original colony in the Sampaji Ghat, Coorg, was restricted to one part of a tributary of the Sampaji river. Since then I have found other colonies along the foot of the Western Ghats in Malabar and a single female has been taken on Salsette Island by Mr. Prater. The species thus differs from all others by being found at or near sea-level. The colouring of the prothorax forms a ready means of identification whilst the appendages will serve to separate it from all other species. As mentioned above, the female described by Dr. Laidlaw as that of *P. gravelyi*, and which was taken at Talewadi, Castle Rock, Kanara (a locality far removed from that wherein the type of *gravelyi* was found), is really the female of *P. mortoni*. Type in the British Museum.

Protosticta hearseyi Fraser.

Protosticta hearseyi Fras. Rec. Ind. Mus. vol. xxiv, pp. 5 and 6, Pl. 1, figs. 3 and 4 (1922); Id. *ibid.* vol. xxvi, p. 499 (1924).

Male. Abdomen 30-35 mm. Hindwing 18-21 mm.

Head.—labium ashy white; labrum turquoise blue narrowly bordered with black along the free margin; the two basal joints of antennæ blue; clypeus turquoise blue; frons, vertex and occiput black; eyes olivaceous above, paling and changing to pale blue beneath.

Prothorax pale blue, immaculate (Fading to pale brown in the dry state.)

Thorax cupreous on the dorsum, pale blue laterally, the middorsal carina finely blue, whilst laterally a broad oblique black stripe traverses the length of the postero-lateral suture and anterior part of metepimeron. Beneath whitish marked with a round spot of black between the legs and a pair of short stripes which converge and become nearly confluent with the anterior spot.

Legs bluish white, the two hind femora with narrow blackish transverse lines on the extensor surface; the knees black.

Wings hyaline, pterostigma black, shaped similarly to the rest of the genus, covering one cell; 10-14 postnodal nervures to forewings, 10-12 in the hind; $R^4 + 5$ arising opposite or distad the oblique nervure descending from the subnode.

Abdomen enfumed brown or cupreous marked with pale blue, this colour more in evidence on the final segments. Segments 1 and 2 with the sides bluish white and with a diffuse longitudinal stripe on the middorsum, incomplete on the apical half of 2; segments 3 to 7 with narrow pale basal annules extending more broadly along the sides and with broad black apical annules; segment 8 turquoise blue with a narrow black apical annule; 9 and 10 black,

the former with a bluish crescentic spot on each side. Segment 7 twice the length of segment 8, 8 half as long again as 9 which is more than twice the length of 10.

Anal appendages black (Pl. figs. 1 and 2) about twice the length of segment 10, forcipate, chelate, broad at the base and furnished here with a robust inwardly directed sub-basal spine, then constricted and sub-cylindrical but again slightly expanded at the apical third to form a 'finger-and-thumb' process, the finger portion considerably longer than the thumb and squared at its apex; the whole appendage curving gently in and downwards. Inferior appendages about four-fifths the length of superiors, truncate, broad at base and tapering to a slightly and gently upturned point, the base furnished with a blunt inner tooth and one or two minute teeth thereafter.

Female. Abdomen 32-33 mm. Hindwing 22 mm.

Very similar to the male and approximately of the same length although more robust in build. Differs as follows,—labrum more broadly bordered with black; eyes olivaceous brown above changing to pale green below; middorsal carina of thorax obscurely white at its upper part only. Wings with 12-13 postnodal nervures to forewings, 12 in the hind; $R^4 + 5$ arising at or but slightly distad of the subnode. Segment 7 with a broader basal annule, segment 8 brownish black marked only with a basolateral dirty white quadrate spot, segment 9 paler brown, marked with a broad white spot on each side confluent with a smaller subdorsal spot of the same colour.

Anal appendages black, very small, about equal in length to segment 10, conical, pointed. Vulvar scale robust, extending beyond end of abdomen.

Distribution.—Nilgiri Hills and Annaimallais. The type was taken at a small brook running through a coffee tote on the Gudalur Ghat, in June; out of 17 specimens, only one was a male. A single male was taken later in the neighbouring Ochterlony valley. Recently I found the species in the Mudis, Annaimallai Hills, 3,000 ft. in May, where about 18 males but no females were taken. The locality was a rocky hillside in virgin jungle where a seepage not amounting to a brook found its way down through fern and moss to the river below, and the whole of the specimens were found in an area not covering more than a quarter of an acre; search in neighbouring jungle revealed none. These specimens were in company with *Heliogomphus promelas* which were equally restricted to the spot. Returning a few days later *via* the Nilgiris, I again found *P. hearseyi* in the same spot on the Gudalur Ghat and by a curious coincidence took a number of females and only one male. This curious incidence of the sexes is very difficult to explain. The small size of the species and its cupreous colouring will serve to identify it from all others of the genus. It is the only species in which the two sexes are approximately of the same length.

Protosticta himalaica Laidlaw.

Protosticta himalaica Laid. Rec. Ind. Mus. vol. xiii, pp. 342, 343 (1917).

Protosticta lindgreni Fras. Journ. Bom. Nat. Hist. Soc., vol. xxix, p. 741 (1923); Id. Ibid., vol. xxvii, p. 150, (1920).

Male. Abdomen 40-43 mm. Hindwing 25-26 mm.

Head,—labium pale brown or brownish yellow; labrum turquoise blue narrowly bordered with black along its free margin; clypeus turquoise blue; frons, vertex and occiput steely bronzed black; eyes black above changing to dark olivaceous and finally pale bluish green beneath.

Prothorax black on dorsum and upper part of sides, marked with a broad subdorsal longitudinal creamy yellow stripe on each side extending from the posterior lobe to the anterior end, yellow low down on the sides.

Thorax bronzed black on dorsum, pale blue at the sides which are marked with a moderately broad black oblique stripe extending along the posterolateral suture. Pale blue beneath unmarked with black. Legs pale sandy yellow, extensor surfaces of all femora black.

Wings hyaline, pterostigma dark reddish brown, almost black with a fine frame of light yellow bordering the enclosing nervures within, about one-third longer than broad, costal side only slightly longer than the posterior and the outer side but slightly longer than the inner; $R^4 + 5$ in the forewings arising

very slightly distad the oblique nervure descending from the subnode but opposite that nervure in the hind; 14-16 postnodal nervures in forewings, 13-15 in the hind.

Abdomen blackish brown marked with white and pale blue as follows,—segment 1 bluish at the sides and with a white apical ring, 2 bluish laterally and marked on the dorsum with a bluish longitudinal stripe not extending to the apical border, segment 3 with a small white dorsal basal triangle and a broad apical black annule, segments 4 to 7 with narrow white basal annules, 4 to 6 with broad black apical annules, segment 7 with its apical half, the whole of 8 and 9 pale blue, segment 10 blue at its extreme base, black apicad. Segments 7 to 10 gradually decreasing in length towards the last segment.

Anal appendages about twice the length of segment 10, dark brown (Pl. figs. 11 and 12); superiors broad at base, compressed, with an angulation on the inner side near the middle not amounting to a spine, after which the appendages are curved downward and abruptly broadened into a scoop-like expansion hollowed out on the inner side. Inferiors slightly longer than the superiors, broad at base, then constricted and again broadened and with the edges strongly curled like a drying leaf. A long inwardly directed narrow spine springing from the upper side of this expansion about the middle of appendage.

Female. Abdomen 37 mm. Hindwing 26 mm.

Very similar to the male, differs only in its shorter and more robust abdomen and in some of the markings of this structure. The venro-lateral aspect of segment 3 as well as 1 and 2 are definitely blue, segments 4 to 6 have broader basal annules especially the latter segment, 8 has a large blue spot on each side, whilst 9 and 10 are reddish brown. (Possibly blue in the living state.) Anal appendages small, rather shorter than segment 10, conical, pointed, blackish brown. Vulvar scale robust, extending a little beyond the end of abdomen.

Distribution.—Northern Bengal, Assam and Sikkim at altitudes of 3,000 to 6,000 ft. I have examined specimens from Kalimpong and Pashok and have taken the insect at Moungpoo, Darjeeling district in May and June. Although so widely spread, it does not appear to be nearly as common as some of the South Indian species. Its habits are entirely similar and it is found in similar localities. Abdominal markings and the shape of the anal appendages which are entirely different to the genotype will serve easily to distinguish it from all others. A fresh comparison of the types of *himalaica* and *lindgreni* has convinced me that they are conspecific, the former name having priority.

Protosticta uncatius, sp. nov.

Male. Abdomen 42 mm. Hindwing 21 mm.

Head,—labium pale brown; labrum turquoise blue narrowly bordered with black along the free margin; anteclypeus turquoise blue; postclypeus, frons, vertex and occiput bronzed black; eyes dark olivaceous green, paler below.

Prothorax pale yellow marked with a pair of ill-defined, longitudinal, subdorsal dark brown stripes made up of a row of three spots, the largest of which is situated on the posterior lobe.

Thorax bronzed black on dorsum, pale blue laterally changing to pale yellow beneath, which is unmarked. A narrow oblique black stripe on each side napping out the postero-lateral suture, and a small upper posthumeral blue spot.

Legs pale yellow, knees darker, hind femora with a black stripe along the extensor surface.

Wings hyaline; pterostigma as broad as long, costal side only slightly longer than posterior, the inner side very oblique, blackish brown framed in black nervures which are lined inwardly with pale yellow; 15-16 postnodal nervures to forewings, 15 in the hind; $R_1 + 5$ well distad of the oblique nervure descending from the subnode.

Abdomen shaded with brown and ringed with blue, white and black as follows,—segment 1 with the sides blue dorsum blackish brown, 2 with the apical half blackish brown, basal half on dorsum warm brown, the sides blue for the basal three-fourths but this colour invaded by the brown of dorsum at its middle, segments 3 to 6 with broad basal pale bluish white annules and equally broad apical black annules, the intervening part warm brown, 7 with

only the basal annule, the rest brown gradually deepening to black at apex, 8 black with a small baso-lateral spot on each side, 9 entirely turquoise blue, 10 entirely black. Segment 7 three times as long as 8, which is half as long again as 9, the latter nearly four times as long as 10.

Anal appendages black; superiors as long as segment 10, broad at base, then tapering as far as their middle at which point they are bent down rather abruptly and terminatè in an expansion shaped like a parrot's beak. Inferior appendages slightly longer, broad at base, spatulate, compressed and furnished at the apex with a tuft of about 10 to 12 stout bristles.

Female. Abdomen 35 mm. Hindwing 21 mm.

Closely similar to the male save for its sexual characters and the slightly shorter and more robust abdomen. Markings of head, thorax and abdomen not differing markedly from the male but segment 9 has a narrow basal black annule and the sides low down dark brown. Wings similar, 15 to 16 postnodal nervures in forewings, 15 in the hind.

Anal appendages very short, not quite as long as segment 10, conical, pointed, blackish brown. Vulvar scale robust, extending beyond end of abdomen.

Distribution.—Maymyo and Gokteik, South Shan States. One male and two females collected by Col. F. Wall, I.M.S., during the early part of June. The species is remarkable for its anal appendages, which like those of *P. himalaica* differ markedly from those of the genotype. The situation of the 'recognition' mark on segment 9 instead of 8 is also quite at variance with other species of the genus. These specimens were taken at light but should the habitat of the insect be discovered, it will probably prove to be similar to that of other species and the species itself equally common.

(To be continued.)